

CS6303

COMPUTER ARCHITECTURE

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OBJECTIVES:

- To make students understand the basic structure and operation of digital computer.
- To understand the hardware-software interface.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To expose the students to the concept of pipelining.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I OVERVIEW & INSTRUCTIONS

9

Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes.

UNIT II ARITHMETIC OPERATIONS

7

ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism.

UNIT III PROCESSOR AND CONTROL UNIT

11

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV PARALLELISM

9

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors

UNIT V MEMORY AND I/O SYSTEMS

9

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design arithmetic and logic unit.
- Design and analyse pipelined control units
- Evaluate performance of memory systems.
- Understand parallel processing architectures.

TEXT BOOK:

1. David A. Patterson and John L. Hennessey, "Computer Organization and Design", Fifth edition, Morgan Kauffman / Elsevier, 2014.

REFERENCES:

1. V. Carl Hamacher, Zvonko G. Varanescic and Safat G. Zaky, "Computer Organisation", VI edition, Mc Graw-Hill Inc, 2012.
2. William Stallings "Computer Organization and Architecture", Seventh Edition, Pearson Education, 2006.

Click Here for **Computer Architecture** full study material.

3. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
4. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata Mc Graw Hill, New Delhi, 2005.
5. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata Mc Graw Hill, 1998.
6. <http://nptel.ac.in/>.